

water. Advisory warnings of winds of force sufficient to interfere with navigation on Lake Michigan were issued on the 5th, 8th, 9th, 10th, and 11th. After the 15th the storm warnings for the Great Lakes were issued from the district forecast center at Chicago.

#### CHICAGO FORECAST DISTRICT.

The limits of the Chicago Forecast District were much enlarged during the month of April, 1922. For many years the district comprised the following States: Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, North and South Dakota, Montana, and Wyoming. On the 16th of April the States of Michigan and Indiana were added, as well as the storm-warning service for the Great Lakes and flying forecasts for zones 4, 7, 8, and 10, these zones embracing the area covered by the forecast district and the Great Lakes. These additions to the Chicago Forecast District were through transfer from the Washington District.

The month of April was marked by frequent storm movement across the district, so that the precipitation over most of the region was considerably above the normal, and excessive even at several points in the central valleys. At the opening of the month flood stages had already developed along the Illinois River, and these conditions became more aggravated from the frequent rains during the month of April, and gradually extended to the section of the Mississippi in the vicinity of the confluence of the Illinois with that river. The task of forecasting river and flood stages is in the hands of the local forecasters, under the direction of the River and Flood Division at Washington, and reference to this portion of the work of the Bureau is made elsewhere in this publication. (See pp. 216.)

April 16 was the date fixed for the beginning of the storm-warning season on the Great Lakes, coincident with the time of the transfer of that service from Washington to the Chicago Forecast District. Immediately thereafter two storms in quick succession moved across the Great Lakes with increasing intensity, one on the 17th and the other on the 19th and 20th. The first of these disturbances was attended by fresh to strong winds reaching gale force on the Lower Lakes with thunder squalls of considerable intensity. The second disturbance was more general, the wind reaching gale force over a wide area. Unusual velocities were attained at several stations, but no damage to shipping was reported, in spite of the fact that early warnings were not possible on account of the sudden and rather freakish development of the storm. The lack of casualties was chiefly due to the fact that a comparatively small number of ships were in commission at the time of the storms.

On the 8th and 9th a rather unusual storm for the season of the year developed in the Rocky Mountain region, pushing southeastward to Montana and Kansas; considerable snow with strong winds and freezing temperature followed in the northern and central Rocky Mountain region and adjoining sections. Live-stock warnings were sent to points in Montana, Wyoming, and the Dakotas on the morning of the 8th, and these doubtless resulted in preventing great loss to stock.

With the advance of vegetation, warnings of the occurrence of frosts became necessary, gradually reaching northward over all the district by the end of the month, except in the more northerly and westerly sections.

During the second half of the month frost occurred a few times in the eastern, southern, and central portions

of the forecast district, and warnings were in practically every case sent in advance to the threatened sections.—*H. J. Cox.*

#### NEW ORLEANS FORECAST DISTRICT.

Small-craft warnings were displayed on the Texas coast April 2, 3, 7, 10, and 16 and were justified. Southeast storm warnings were ordered for the Texas coast April 4, 7, and 8, and storm-verifying velocities as a rule occurred generally during these displays. No general storm occurred without warning.

Frost occurred in the northwestern portion of the district on the 11th and in the northern portion on the 18th and 19th, for which warnings were issued.

Norther warnings were issued for Tampico April 19.—*I. M. Cline.*

#### DENVER FORECAST DISTRICT.

The month was abnormally cold in the Denver Forecast District, retarding the development of fruit buds.

On the morning of the 8th an area of low pressure was central in the northern Rocky Mountain region. It moved southeastward across the district, attended by freezing temperatures in western Utah on the 9th, Modena, Utah, reporting a temperature of 8°. Freezing temperatures prevailed on the morning of the 10th, except in the extreme southern portion of the district, with readings of 18° at Durango and Santa Fe, and on the morning of the 11th freezing temperatures were reported as far south as the Pecos Valley, with a heavy frost at Roswell. Timely warnings were issued for these conditions. A disturbance, that was over Colorado on the morning of the 15th, moved southward to northern New Mexico on the 16th, and was followed by an anticyclonic area that overspread the entire district by the 18th. Freezing temperature or frost warnings were issued for the greater part of the district on the 15th, 16th, 17th, and 18th, and included southeastern New Mexico on the 17th and 18th. Freezing temperatures occurred as forecast, with readings of 15° to 20° in the fruit valleys of Colorado on the 18th and 24° to 28°, with heavy frost in the Pecos Valley on the morning of the 19th. Another area of high pressure occupied the northeastern slope on the morning of the 27th and the barometer was rising in most western districts. Warnings of frost or freezing temperature were issued for western Colorado and frost in northern and eastern New Mexico. While cold weather, with freezing temperatures, occurred in localities in the Gunnison Valley, in western Colorado, a trough of low pressure developed on the western slope and the attending cloudiness prevented the formation of frost.—*Frederick W. Brist.*

#### SAN FRANCISCO FORECAST DISTRICT.

The weather during the first half of the month was much like that of March, when a succession of small depressions moved inland over British Columbia and thence southeastward over the Plateau. This condition gave many days of precipitation, but the amounts were small, over the northern portion of this district. The precipitation seldom extended south of Cape Mendocino on the coast and southern and eastern Nevada in the interior. In California only a few light showers fell. The latter part of the month was marked by a change to fair weather which was unbroken except for rain in Washington and Oregon on the 22d and western Washington on the 27th and 28th.